

- 2 -

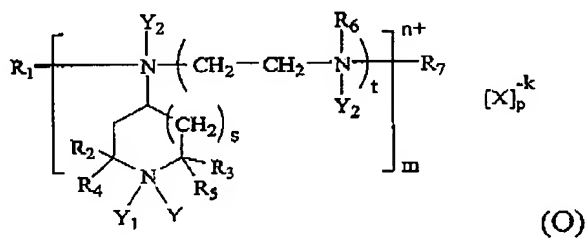
The Commissioner of Patents

Serial No. 10/532,138

CLAIM AMENDMENTS

Claims 1, 2, 7, and 10 are amended as indicated hereinafter; claims 24 to 29 are cancelled; and new claims 30 to 32 are presented.

1. (currently amended) A method for the production of light-stable and process-stable lignocellulosic materials ~~such as mechanical wood pulps~~ comprising the reaction of ~~these~~ the lignocellulosic materials in an aqueous medium, in an alkaline peroxide bleaching medium, or in an aqueous medium with a subsequent bleaching of the materials in an alkaline peroxide bleaching medium, with a water-soluble, yellowing inhibitor or hindered amine light stabilizer possessing two or more secondary and/or tertiary amino or ammonium, and/or quaternary ammonium groups of the general formula (O):



wherein s is 0, resulting in a 5-membered pyrrolidine ring, or 1, resulting in a 6-membered piperidine ring;

k is an integer of 1 to 5,

n is an integer of 0 to 5002, ~~more preferably 0 to 502, even more preferably 0 to 52, and most preferably 0 to 12;~~

m is an integer of 1 to 5,

t is an integer of 1 or more, ~~preferably 1 to 5000, more preferably 1 to 500, even more preferably 1 to 50, and most preferably 1 to 10;~~

p is an integer of 0 to 5002, ~~more preferably 0 to 502, even more preferably 0 to 52, and most preferably 0 to 12;~~ provided that when n is 0, p is 0, then m is 1, and both Y₁ and Y₂ are absent;

- 3 -

The Commissioner of Patents

Serial No. 10/532,138

X is an inorganic or organic anion;

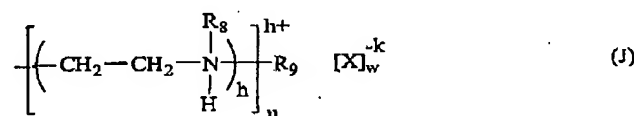
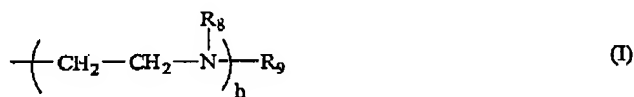
Y is oxyl (O[•]), hydroxyl (OH) or hydrogen (H), and Y₁ is hydrogen or absent, provided that when Y₁ is hydrogen, Y is hydroxyl;

Y₂ is hydrogen or is absent, provided that when Y₂ is hydrogen, n = t + 1 or t + 2, and when Y₂ is absent, n is 0 or 1;

R₂, R₃, R₄ and R₅ are independently alkyl groups (CH₂)_jH unsubstituted or substituted by 1 to a (2j+1) number of substituents, selected from hydroxyl, mercapto, lower alkoxy, lower alkylthio, benzyl, amino, lower alkyl ester, amide, carboxyl and carboxylate groups, or a radical derived from an organic ultraviolet absorber ~~such as 2,4-dihydroxybenzophenone or 2-(2-hydroxyphenyl)benzotriazole~~; and being uninterrupted or interrupted by 1 to j number of heteroatoms selected from -O- and -S-, wherein j is 1 to 14, ~~preferably 1 to 6, and more preferably 1 to 4;~~ ;

R₁ is hydrogen or an ethylene amino or ammonium group of formula (I) or (J); when t ≥ 2, R₆ and R₇ are independently hydrogen, a radical (functional group) derived from an organic ultraviolet absorber ~~such as 2,4-dihydroxybenzophenone or 2-(2-hydroxyphenyl)benzotriazole~~, or a radical (functional group) of the formula (K), (L), (M) or (N);

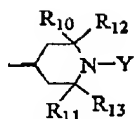
when t = 1, R₆ is hydrogen and R₇ is a radical (functional group) derived from an organic ultraviolet absorber ~~such as 2,4-dihydroxybenzophenone or 2-(2-hydroxyphenyl)benzotriazole~~, or a radical (functional group) of the formula (K), (L), (M) or (N):



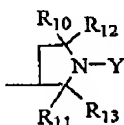
- 4 -

The Commissioner of Patents

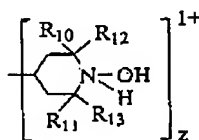
Serial No. 10/532,138



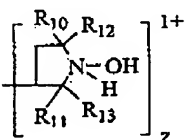
(K)



(L)

 $[X]_y^{-k}$

(M)

 $[X]_y^{-k}$

(N)

wherein $h \geq 1$, preferably 1 to 5000, more preferably 1 to 500, even more preferably 1 to 50, and most preferably 1 to 10;

X is the same as defined above;

k is 1 to 5,

w is ≥ 1 , preferably 1 to 5000, more preferably 1 to 500, even more preferably 1 to 50, and most preferably 1 to 10,

u = 1 to 5, the total charge $kw = hu$ in formula (J);

R_8 and R_9 are independently hydrogen, a radical (functional group) derived from an organic ultraviolet absorber such as 2,4-dihydroxybenzophenone or 2-(2-hydroxyphenyl)benzotriazole, or a radical (functional group) of the formula (K), (L), (M) or (N);

R_{10} , R_{11} , R_{12} and R_{13} are independently alkyl groups $(CH_2)_iH$ unsubstituted or substituted, by 1 to a $(2i+1)$ number of substituents selected from, hydroxyl, mercapto, lower alkoxy, lower alkylthio, benzyl, amino, lower alkyl ester, amide, carboxyl and carboxylate

- 5 -

The Commissioner of Patents

Serial No. 10/532,138

groups, or radicals derived from an organic ultraviolet absorber such as 2,4-dihydroxybenzophenone or 2-(2-hydroxyphenyl)benzotriazole; and being uninterrupted or interrupted by i heteroatoms selected from -O- and -S-, wherein i is 1 to 14, preferably 1 to 6, and more preferably 1 to 4;

X is the same as defined above;

k is 1 to 5,

y is 1,

z is 1 to 5, the total charge $ky = z$ in formula (M) or (N);

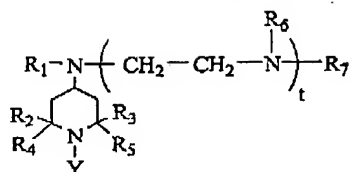
Y is oxyl (O[·]), hydroxyl (OH) or hydrogen (H), provided that: i) Y₂ is hydrogen or ii) Y₂ and Y₁ are both absent and Y is hydrogen.

2. (currently amended) A method according to claim 1 wherein formula (O) is of a water-soluble, yellowing inhibitor possessing two or more secondary and/or tertiary amino or ammonium groups, and/or quaternary ammonium groups of the formula (A), (B), (C), (D), (E), (F), (G) or (H) wherein Y is oxyl (O[·]) or hydroxyl (OH) and the reaction is in an aqueous medium, or formula (O) is of ~~a~~ a water-soluble, fibre-reactive hindered amine light stabilizer of the formula (A), (B), (C) or (D) wherein Y is hydrogen (H) and the reaction is in an alkaline peroxide bleaching medium or in an aqueous medium with a subsequent bleaching of the materials in an alkaline peroxide bleaching medium:

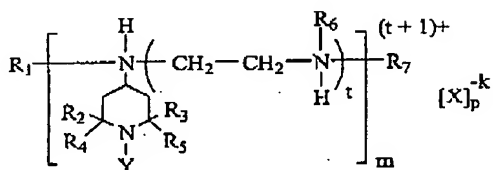
- 6 -

The Commissioner of Patents

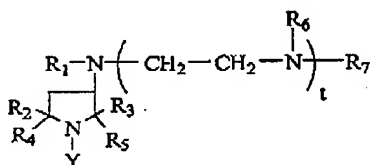
Serial No. 10/532,138



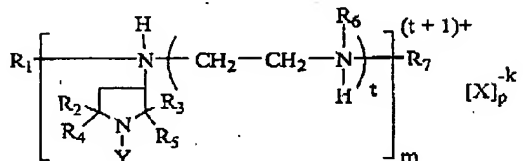
(A)



(B)



(C)

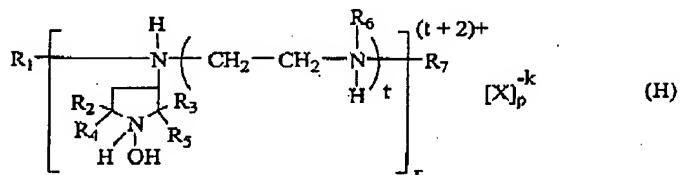
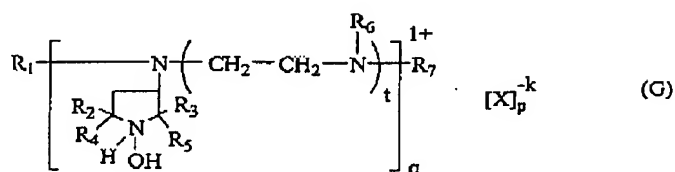
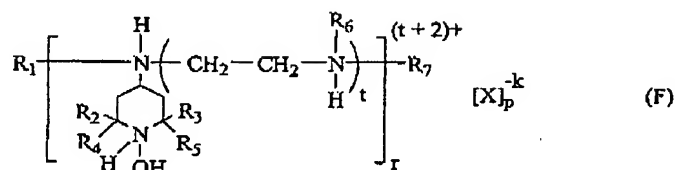
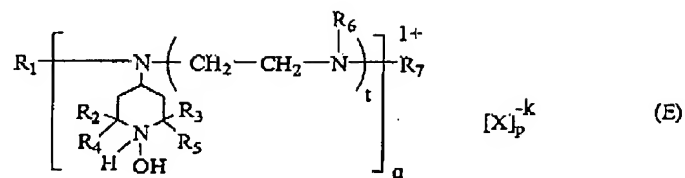


(D)

- 7 -

The Commissioner of Patents

Serial No. 10/532,138



wherein R_2 , R_3 , R_4 and R_5 are independently alkyl groups $(CH_2)_jH$ unsubstituted or substituted by 1 to a $(2j+1)$ number of substituents, selected from hydroxyl, mercapto, lower alkoxy, lower alkylthio, π -benzyl, amino, lower alkyl ester, amide, carboxyl and carboxylate groups, or a radical derived from an organic ultraviolet absorber such as 2,4-dihydroxybenzophenone or 2-(2-hydroxyphenyl)benzotriazole; and being uninterrupted or interrupted by 1 to j number of heteroatoms selected from $-O-$ and $-S-$, wherein j is 1 to 14, preferably 1 to 6, and more preferably 1 to 4;

- 8 -

The Commissioner of Patents

Serial No. 10/532,138

X is an inorganic or organic anion such as carbonate, bicarbonate, chloride, bisulfate, sulfate, formate, acetate, citrate, phosphate, oxalate, ascorbate, ethylenediaminetetraacetate, or diethylenetriaminepentaacetate;

k is 1 to 5,

p is an integer of 1 to 5001, ~~more preferably 1 to 501, even more preferably 1 to 51, and most preferably 1 to 11~~ in formula (B) or (D), p is 1 in formula (E) or (G), and p is 1 to 5002, ~~more preferably 1 to 502, even more preferably 1 to 52, and most preferably 1 to 12~~ in formula (F) or (H),

m is 1 to 5,

q is 1 to 5,

r is 1 to 5,

the total charge of $kp = (t + 1)m$ in formula (B) or (D), $kp = q$ in formula (E) or (G), and $kp = (t + 2)r$ in formula (F) or (H);

t is ≥ 1 , ~~preferably 1 to 5000, more preferably 1 to 500, even more preferably 1 to 50, and most preferably 1 to 10~~;

R_1 is hydrogen or an ethylene amino or ammonium group of formula (I) or (J);

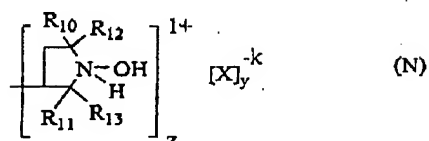
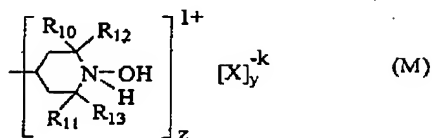
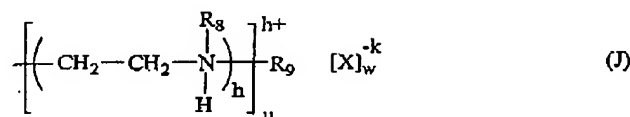
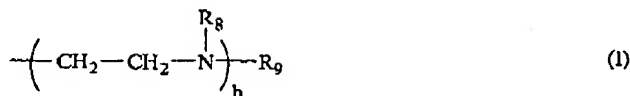
when $t \geq 2$, R_6 and R_7 are independently hydrogen, a radical (functional group) derived from an organic ultraviolet absorber such as 2,4-dihydroxybenzophenone or 2-(2-hydroxyphenyl)benzotriazole, or a radical (functional group) of the formula (K), (L), (M) or (N);

when $t = 1$, R_6 is hydrogen and R_7 is a radical (functional group) derived from an organic ultraviolet absorber such as 2,4-dihydroxybenzophenone or 2-(2-hydroxyphenyl)benzotriazole, or a radical (functional group) of the formula (K), (L), (M) or (N):

- 9 -

The Commissioner of Patents

Serial No. 10/532,138



wherein $h \geq 1$, preferably 1 to 5000, more preferably 1 to 500, even more preferably 1 to 50, and most preferably 1 to 10;

X is the same as defined above;

k is 1 to 5,

w is ≥ 1 , preferably 1 to 5000, more preferably 1 to 500, even more preferably 1 to 50, and most preferably 1 to 10,

- 10 -

The Commissioner of Patents

Serial No. 10/532,138

u = 1 to 5, the total charge kw = hu in formula (J);

R₈ and R₉ are independently hydrogen, a radical (functional group) derived from an organic ultraviolet absorber such as ~~2,4-dihydroxybenzophenone or 2-(2-hydroxyphenyl)benzotriazole~~, or a radical (functional group) of the formula (K), (L), (M) or (N);

R₁₀, R₁₁, R₁₂ and R₁₃ are independently alkyl groups (CH₂)_iH unsubstituted or substituted, by 1 to a (2i+1) number of substituents selected from, hydroxyl, mecapto, lower alkoxy, lower alkylthio, benzyl, amino, lower alkyl ester, amide, carboxyl and carboxylate groups, or radicals derived from an organic ultraviolet absorber such as ~~2,4-dihydroxybenzophenone or 2-(2-hydroxyphenyl)benzotriazole~~; and being uninterrupted or interrupted by i heteroatoms selected from -O- and -S-, wherein i is 1 to 14, ~~preferably 1 to 6, and more preferably 1 to 4~~;

X is the same as defined above;

k is 1 to 5,

y is 1,

z is 1 to 5, the total charge ky = z in formula (M) or (N);

Y is oxyl (O[•]), hydroxyl (OH) or hydrogen (H).

3. (original) A method according to claim 2 wherein said material is reacted with said yellowing inhibitor in said aqueous medium.

4. (original) A method according to claim 2 wherein said material is reacted with said stabilizer in said alkaline peroxide bleaching medium.

5. (original) A method according to claim 2 wherein said material is reacted with said stabilizer in an aqueous medium with a subsequent bleaching of the reacted material in said alkaline peroxide bleaching medium.

- 11 -

The Commissioner of Patents

Serial No. 10/532,138

6. (previously presented) A method according to claim 1, wherein said lignocellulosic material is a wood pulp and including steps of forming a paper from the resulting pulp and coating the paper with an ultraviolet absorber.

7. (currently amended) A method according to claim 1, wherein at least one of the R₂, R₃, R₄, R₅, R₆ and R₇ groups in the said yellowing inhibitors or hindered amine light stabilizers contains an organic ultraviolet absorber ~~derived from, for example, 2,4-dihydroxybenzophenone, 2-hydroxybenzophenone or 2-(2-hydroxyphenyl)benzotriazole.~~

8. (previously presented) A method according to claim 1, wherein X is selected from carbonate, chloride, bisulfate, sulfate, formate, acetate, citrate, phosphate and ascorbate.

9. (previously presented) A method according to claim 1 wherein the yellowing inhibitor is N-(2,2,6,6-tetramethyl-1-oxyl-piperidin-4-yl)-N'-{2-[2-(2,2,6,6-tetramethyl-1-oxyl-piperidin-4-ylamino)-ethylamino]-ethyl}-ethane-1,2-diamine synthesized from a reductive amination of 4-oxo-2,2,6,6-tetramethylpiperidine-N-oxyl with triethylenetetramine in the presence of a reducing agent such as sodium triacetoxymethylborohydride.

10. (currently amended) A method according to claim 1 wherein the yellowing inhibitor is N-(2,2,6,6-tetramethyl-1-hydroxyl-piperidin-4-yl)-N'-{2-[2-(2,2,6,6-tetramethyl-1-hydroxyl-piperidin-4-ylamino)-ethylamino]-ethyl}-ethane-1,2-diamine hexahydrochloride synthesized from the reductive amination of 4-oxo-2,2,6,6-tetramethylpiperidine-N-oxyl with triethylenetetramine in the presence of a reducing agent ~~such as sodium triacetoxymethylborohydride~~, followed by reaction with hydrochloric acid in ethanol.

11. (previously presented) A method according to claim 1, wherein the reaction of the lignocellulosic material is conducted with a charge of the yellowing inhibitor or hindered

- 12 -

The Commissioner of Patents

Serial No. 10/532,138

amine light stabilizer of 0.01% to 2.00%, by weight, based on the oven dry weight of the lignocellulosic material.

12. (original) A method according to claim 11 wherein said amount is 0.2% to 1.0%, by weight.

13. (previously presented) A method according to claim 1, wherein the reaction is conducted at a temperature of 20 – 120 °C, a consistency of 0.01% - 50%, and a time of 5 seconds to several hours.

14. (previously presented) A method according to claim 1, wherein the reaction in an aqueous medium is conducted at a pH of 3.5 – 12.5.

15. (previously presented) A method according to claim 1 wherein a reducing agent or an acid is added to the reaction medium.

16. (previously presented) A method according to claim 1, wherein the material is a pulp and the resulting pulp is treated with a reducing agent or an acid.

17. (previously presented) A method according to claim 1, wherein the reaction and/or bleaching is conducted in the presence or absence of air or oxygen.

18. (previously presented) A method according to claim 1, wherein the lignocellulosic material is a mechanical wood pulp and the reaction is carried out in a single-stage or multi-stage in one or more than one refiner, bleach tower, pulp mixer, a storage vessel, or any other reaction vessel suitable for performing the alkaline hydrogen peroxide bleaching of the pulp.

- 13 -

The Commissioner of Patents

Serial No. 10/532,138

19. (previously presented) A method according to claim 1, wherein the lignocellulosic material is wood chips and at least one of said reaction and bleaching is carried out in a single-stage or multi-stage in one or more than one impregnator.

20. (original) A method according to claim 19 wherein the impregnation of the wood chips is conducted at a temperature of 40 - 90 °C, a solid content of 30 - 60%, by weight, and an impregnation time of 5 minutes to 2 hours.

21. (previously presented) A method according to claim 1 wherein the lignocellulosic material is a wood pulp and the reaction of said yellowing inhibitor with the pulp is carried out in an agitated tank or any other stock preparation vessels of a paper machine.

22. (cancelled)

23. (cancelled)

24. (cancelled)

25. (cancelled)

26. (cancelled)

27. (cancelled)

28. (cancelled)

29. (cancelled)

30. (new) A method according to claim 1, wherein Y_2 is hydrogen.

- 14 -

The Commissioner of Patents

Serial No. 10/532,138

31. (new) A method according to claim 1, wherein Y_2 and Y_1 are both absent and Y is hydrogen.

32. (new) A method according to claim 1, wherein said reaction is with said water soluble, yellowing inhibitor, and said inhibitor is N-(2,2,6,6-tetramethyl-1-hydroxyl-piperidin-4-yl)-N'-{2-[2-(2,2,6,6-tetramethyl-1-hydroxyl-piperidin-4-ylamino)-ethylamino]-ethyl}-ethane-1,2-diamine hexahydrochloride.